

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
1 April 2004 (01.04.2004)

PCT

(10) International Publication Number  
**WO 2004/027825 A3**

(51) International Patent Classification<sup>7</sup>: **C23C 16/00**,  
C23F 1/02, H01J 7/24

(21) International Application Number:  
PCT/US2003/029204

(22) International Filing Date:  
19 September 2003 (19.09.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/412,051 19 September 2002 (19.09.2002) US

(71) Applicant (for all designated States except US): **AP-  
PLIED PROCESS TECHNOLOGIES, INC.** [US/US];  
546 East 25th Street, Tucson, AZ 85713 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **MADOCKS, John**  
[US/US]; 110 E. Yvon Drive, Tucson, AZ 85704 (US).

(74) Agent: **REGELMAN, Dale, F.**; Law Office of Dale F.  
Regelman, P.C., 4231 S. Fremont Avenue, Tucson, AZ  
85714 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,  
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,  
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,  
MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT,  
RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,  
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

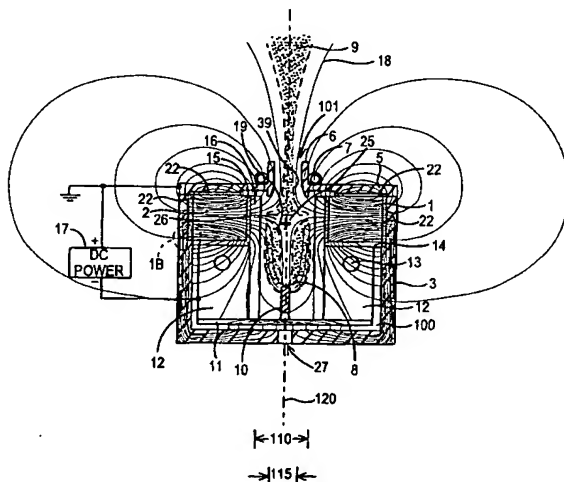
## Published:

- with international search report
- before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

(88) Date of publication of the international search report:  
28 April 2005

[Continued on next page]

(54) Title: BEAM PLASMA SOURCE



(57) Abstract: A plasma source which includes a discharge cavity having a first width, where that discharge cavity includes a top portion, a wall portion, and a nozzle disposed on the top portion and extending outwardly therefrom, where the nozzle is formed to include an aperture extending through the top portion and into the discharge cavity, wherein the aperture has a second width, where the second width is less than the first width. The plasma source further includes a power supply, a conduit disposed in the discharge cavity for introducing an ionizable gas therein, and at least one cathode electrode connected to the power supply, where that cathode electrode is capable of supporting at least one magnetron discharge region within the discharge cavity. The plasma source further includes a plurality of magnets disposed adjacent the wall portion, where that plurality of magnets create a null magnetic field point within the discharge cavity.

WO 2004/027825 A3



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US03/29204

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : C23C 16/00; C23F 1/02; H01J 7/24

US CL : 118/723 DC, 723R, 723VE, 723EB; 156/345.33, 345.35; 315/111.81, 111.91, 111.41

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 118/723 DC, 723R, 723VE, 723EB; 156/345.33, 345.35; 315/111.81, 111.91, 111.41

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,838,120 (SEMENKIN et al) 17 November 1998 (17.11.1998), Figures 1-3.	1-19

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21 July 2004 (21.07.2004)

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (703)305-3230

Date of mailing of the international search report

10 MAR 2005

Authorized officer

Tuyet Vo

Telephone No. 571 272 1830